IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In Re Application of:	) Atty. Docket: **TM&K0008**
	) Confirmation No.: 9092
Shinji TAKEDA et al .	)
	)
Serial No. 09/785,486	) Group Art Unit: 2827
	)
Filed: February 20, 2001	) Examiner: D. GRAYBILL
	)
For: SEMICONDUCTOR DEVICE AND PROCESS FOR FABRICATION THEREOF	)

DECLARATION UNDER 37 C.F.R. § 1.132

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

1. I, MASUKO Takashi, state that I am an expert in the field of semiconductor research and development. I received a Master of Science degree in Environmental Science from the University of Tsukuba in March 1992. I worked in the Tsukuba Research Laboratory, Hitachi Chemical Company Ltd. from April 1992. I have worked in Packaging Material Laboratory, Research & Development Center, Hitachi Chemical Company Ltd. since June 1999. I have been engaged in the development of die attach materials since 1992.

2. I have authored or co-authored and published, for example, the following papers.

1. S. Takeda, T. Masuko: Proceedings of the 1997 Electronic Components and Technology Conference (ECTC), pp. 518-524, 1997.

2. S. Takeda, T. Masuko: Proceedings of the 2000 Electronic Components and Technology Conference (ECTC), pp. 1616-1622, 2000.

3. T. Masuko, S. Takeda: Proceedings of the 9th Micro Electronic Symposium (MES), pp. 249-252, 1999.

4. S. Takeda, T. Masuko: Hitachi Chemical Technical Report, No. 24, pp. 25-28, 1995.

3. I am familiar with the above-captioned patent application and understand that certain prior art references were cited against the claims of the application. Specifically, I am familiar with the Morita et al. reference (U.S. Patent 5,406,124).

4. The foregoing experimental results were collected directly by me, or by others under my direct supervision, and that the experiments were performed with my understanding and knowledge.

5. **Experimental Conditions**

The purpose of this experiment was to compare the closest prior art filmy organic die-bonding material ("prior art film") to the filmy organic die-bonding material of the present invention ("novel film"). Specifically, we utilized the film disclosed by Morita et al. (U.S. Patent 5,406,124) as the closest prior art film and compared the adhesion characteristics (peel strength) and the durability (rate of occurrence of reflow cracks) of the prior art film to the novel film.

6. **Prior Art Film**

The prior art film was produced using the method described by Morita as "EXAMPLE 2" (column 15, line 5 to 15). An amount of 36.8g (0.1 mol) of 4,4-bis(3-aminophenoxy)biphenyl and 137.6 g of N,N-dimethylacetamide were introduced into a container equipped with an agitator, a reflux condenser, and a nitrogen introducing pipe. Thereafter, 10.36g (0.0475 mol) of pyromellitic acid dianhydride and 13.97 g (0.0475 mol) of 3,3',4,4-biphenyltetracarboxylic acid dianhydride were added little by little into the container under nitrogen atmosphere at room temperature. The mixture was agitated for 20 hours at room temperature. This process produced a polyimide acid varnish.

Next, a Base film of 50 μm thickness was coated on both sides with the polyimide varnish

produced by the previous steps. The coated film was then dried at 100°C for 1 hour followed by drying at 310°C for 1 hour. The result was a three-tiered film having a 10 μm thick polyimide layer (Tg230°C) corresponding to the prior art film of Embodiment No. 13 of the Morita reference (See Table in Morita reference).

The Embodiment No. 13 of the Table in the Morita reference, which corresponds to the film produced using the method outlined in Example 2 of the Morita reference, was selected to represent the closest prior art. I believe, based upon my experience in the art, that Embodiments Nos. 1 through 24 compiled in Table 1 of the Morita reference would manifest similar areal peel strengths because these examples exhibit only minor differences in the structure of the original materials, the acid anhydride, and the diamine, used to formulate them.

7. Novel Film

The novel film was produced using the method disclosed in the specification as originally filed (page 19, line 13 to page 20, line 21). An amount of 280 g of organic solvent (N-methylpyrrolidone) was added to 100 g of polyimide, specifically identified as Polyimide F in the specification and made from DBTA (1, 10-(decamethylene)bis(trimellitate anhydride) / BAPP (2,2-bis[4-(4-aminophenoxy)phenyl] propane), in 10 g of epoxy resin. The mixture was stirred thoroughly until the mixed solution was homogeneously dispersed. The product of these steps was a coating varnish.

Next, a carrier film (OPP film; biaxially stretched polypropylene) was coated with the coating varnish of the previous step. The coated carrier film was then heated in a dryer with internal air circulation for 30 minutes at a temperature of 80°C followed by 30 minutes at 150°C. This heating process evaporated the solvent and dried the varnish. After drying, the carrier film was removed and

the resulting novel film obtained had a thickness of 20 μm. This film corresponds to film No. 8, Table 1, of the specification (page 21) of the above captioned application.

8. **Evaluation of Films**

(1) Evaluation of film adhesiveness

To evaluate film adhesiveness, the prior art and novel films were cut into 5 x 5 mm sized pieces. Each piece of film was then die-bonded to a 42 alloy lead frame at a temperature of 250°C and a pressure of 120gf/mm^2 maintained for 5 seconds. Each film was subsequently die-bonded to a 5 x 5 mm silicon chip to form the structure (21, 22, 23) illustrated in Figure 2 of the specification. The experiment was repeated under three different die-bonding conditions. Table 1 shows the conditions under which 5 x 5 mm silicon chips were die-bonded to the lead frame.

Peel strength, as defined in the above -captioned application, was measured by a push-pull gauge at a test speed of 0.5 mm/minute and oriented to pull at a 17-degree angle relative to the surface of each chip as it was described in the present invention's specification (page 33, lines 1-16; Figure 2), except that the samples were tested on the lead frame die-bonded to silicon chips via either the prior art film or the novel film respectively. Furthermore, it is noted that each sample was tested at its respective die-bonding temperature f or 20 seconds. The results are expressed as the force in kgf per chip required to peel the silicon chip from the lead frame.

Table 1

Die -bonding Condition	Reason for using the condition	Film	Peel strength (kgf/chip)
250°C x 30gf/mm²x 20 sec	Described in present claims	Morita's film	0.015
		Novel film	>6 (All chips destroyed)
250°C x 4gf/mm²x 2 sec	Described in present claims	Morita's film	0.00 (No adhesion occurred)
		Novel film	1.15
230°C x 0.6gf/mm². x 1 sec	Condition of Example 2 No. 7-10 of the present invention	Morita's film	0.00 (No adhesion occurred)
		Novel film	0.55

(2) Evaluation of reflow cracks

As described in section 8, subparagraph (1) supra, we used identical die-bonding conditions when die-bonding films and chips. To evaluate the rate of occurrence of reflow cracks, semiconductor devices were fabricated utilizing either the prior art film or the novel film. The method of fabricating the semiconductor devices is that method disclosed in the specification (page 19, line 25 to page 20, line 21) of the above captioned application, with the exception that the die-bonding was carried out at the conditions specified in Tables I and II of this declaration. After the die-bonding was carried out, the product underwent wire bonding and then molding with an encapsulant material (CEL9000, Hitachi Chemical Co., Ltd.) to form a semiconductor device. Each semiconductor device was then treated in a thermo-hygrostat at 85°C and 85% relative humidity (RH) for 168 hours, and thereafter heated at 240°C for 10 seconds in an infrared reflow furnace.

The rate of occurrence of reflow cracks was determined by molding each semiconductor device with polyester resin, then cutting each device with a diamond cutter to

expose a cross section. Each cross section was observed via a microscope for cracks (referred to as "reflow cracks," specification, page 2, lines 16-19). The rate (%) of occurrence of reflow cracks is defined by the following expression: rate (%) of occurrence of reflow cracks = (number of occurrence of reflow cracks/number of tests) x 100. The test results are presented in Table 2.

Table 2

Die -bonding Condition	Reason for using the condition	Film	Rate of occurrence of reflow cracks (%)
250°C x 30gf/mm² x 20 sec	Described in present claims	Morita's film	100
		Novel film	0
250°C x 4gf/mm² x 2 sec	Described in present claims	Morita's film	100
		Novel film	0
230°C x 0.6gf/mm² x 1 sec	Condition of Example 2 No. 7-10 of the present invention	Morita's film	100
		Novel film	0

9. **Discussion of the Results**

The comparative data compiled in Tables 1 and 2 is commensurate in scope with all of the claims because the die-bonding conditions listed in Tables 1 and 2 all fall within the scope of the die-bonding conditions recited in independent claims 17, 19 and 30. Furthermore, each of the tested films in Tables 1 and 2 are made in accordance with the presently claimed invention and include Polyimide F, which was made from DBTA in epoxy resin. Therefore, each of the tested films in Tables 1 and 2 comprise "an organic material selected from the group consisting of epoxy resin and polyimide resin" as recited in independent claims 17, 19 and 30. Lastly, each of the tested films in Table 1 have the property of a "peel strength of 0.5 kgf/(5 mm x 5 mm chip) or higher" as recited in claims 17, 19 and 30. In view of these facts, the experimental data compiled in Tables 1 and 2 has been shown to be

commensurate in scope with all of the present claims.

As is clearly shown in Table 1, under each set of die-bonding conditions, the novel film outperformed the areal adhesiveness of Morita's prior art film. Unexpectedly, the areal adhesiveness of the novel film was so great when die-bonded under certain conditions that it could not be fully measured (kfg > 6) by the 17-degree peel strength test used in this experiment because the silicon chips would break before the areal adhesion of the novel film would give way.

As is clearly shown in Table 2, under each set of die-bonding conditions, the novel film outperformed Morita's prior art film in an unexpected way. Specifically, while every one of the semiconductor devices made with the prior art film demonstrated reflow cracks, none of the semiconductor devices made with the novel film suffered these defects. This result is plainly not a matter of degree, but is a matter of unexpected superiority.

10. **Discussion of Peel Strength**.

The peel strength as defined in the present specification, and as used in the claims, was measured using the push-pull gauge oriented to exert a force at an angle of 17 degrees relative to the planar surface of each chip as illustrated in Fig. 2, and as described on page 33, lines 1-16, of the above captioned application. It is clear from the disclosure of the originally filed, above-captioned application, that "peel strength" as used in the specification is a 17-degree peel strength rather than a conventional 90-degree peel strength or a conventional 180-degree peel strength. The "peel strength", as described and defined in the present application, is a unique test that has advantages over conventional peel strength testing methods for the following reasons.

Specifically, a conventional 90-degree peel strength test, (i.e., "Adhesives – Peel test for a flexible-bonded-to-rigid test specimen assembly" shown in Figure 1 of the International Standard ISO

8510-1:1990(E)), would orient the push-pull gauge so as to exert a force at an angle of 90 degrees relative to the planar surface of the test chip. Conventional 90-degree peel strength is typically measured in units of force per unit length (See Figure 2 of International Standard ISO 8510-1:1990(E)), although the Morita et al. reference reports 90-degree peel strength values in terms of force only (See "Resistance against Peeling" values reported in grams in the Table of U.S. Patent 5,406,124).

A conventional 180-degree peel strength test, (i.e., the "Standard Test Method for Peel or Stripping Strength of Adhesive Bonds" shown in Fig. 2, the Annual Book of ASTM Standards, Designation: D 903-98, 1999), orients the push-pull gauge so as to exert a force at an angle of 180 degrees relative to the planar surface of the test chip. Conventional 180-degree peel strength is typically measured in units of force per length of width (See ASTM Standards, Designation: D 903-98, 1999, section 3.2.2).

I believe that those skilled in the art would know that a 90-degree peel strength test evaluates linear areal adhesive strength whereas a 180-degree peel strength test evaluates shear adhesive strength. On the other hand, the 17-degree peel strength test described on page 33, lines 1-16, and Figure 2, of the above captioned application is a test of oblique or diagonal areal adhesive strength.

The peel strength test described on page 33, lines 1-16, and shown in Figure 2, of the above captioned application, is a different and more efficient test than either of the 90degree peel strength test and the 180-degree peel test because the invention's 17-degree peel test provides, in a single test, a measurement related to both linear and shear adhesive peel strength properties. However, because there is generally no linear relationship between linear and shear adhesive peel strengths, there is no known conversion factor for converting between linear and adhesive peel strength values (i.e., 90-degree peel strength values and 180-degree peel strength values, respectively). Likewise, there is no known

conversion factor for converting between the 17-degree peel strength values according to the definition in the specification, which reflect oblique or diagonal areal adhesion strength, collected in accordance with the method described in the present application, and either conventional 90-degree peel strength values or conventional 180-degree peel strength values.

There are several reasons for developing the peel strength test described on page 33, lines 1-16, and in Figure 2, of the above captioned application. First, the 17-degree peel strength test according to the invention is more efficient in that a single test provides information regarding both linear and shear adhesive strength properties by testing oblique or diagonal areal adhesive strength. Second, the invention's peel strength test provides information related to the interaction of linear and shear adhesive strength properties by measuring the adhesive strength when an oblique or diagonal force is applied. This adhesive strength measured when an oblique or diagonal force is applied is an oblique or diagonal areal adhesive strength, which should depend upon linear areal adhesive strength, shear adhesive strength and the interaction of linear and shear adhesive strengths of the films. This information is relevant to the advantages of the presently claimed invention, which endeavors to minimize the occurrence of re flow cracks and the detrimental effects on semiconductor packages caused by reflow cracks (See present specification, page 2, line 16, to page 3, line 19). The peel strength test described and defined in the present application measures the oblique/diagonal areal adhesive strength, which is an indirect measure of reflow cracking. The finding that reflow cracks can be prevented by employing a certain minimum value for the oblique/diagonal areal adhesive strength is a new finding unrelated to previously known, conventional linear and shear adhesive strengths of organic die-bonding films.

Lastly, choosing force per area as the representational units for measurements of areal adhesion strength tested in the above captioned application, using the 17-degree peel strength test,

was done as a matter of convenience. Specifically, the push-pull gauge measures force in kg force units and each test chip had an area of 5 mm x 5 mm. Therefore, reporting oblique/diagonal areal adhesive strength in terms of kg of force per 5 mm x 5 mm chip area was the simplest way to report the measured values. I believe that a person skilled in the art would realize that the 17-degree peel strength test method described and defined in the above captioned application is a unique test, and that our choice of units are acceptable and useful so long as we use them uniformly throughout our comparative testing.

11. Conclusions

I believe the comparative testing compiled in Tables 1 and 2 above reasonably support the following conclusions. First, the data collected in Tables 1 and 2 is commensurate in scope with the presently claimed invention. Second, the oblique/diagnonal areal adhesive strength of the films made in accordance with the presently claim invention, as measured by peel strength testing reported in Table 1, is unexpectedly superior to the oblique/diagonal areal adhesive strength of the Morita film representing the closest prior art. Third, the absence of reflow cracking of films made in accordance with the presently claimed invention compared to the presence of reflow cracking of the Morita film representing the prior is another unexpected and superior characteristic of the films of the present invention.

Lastly, I believe that my testimony establishes the rationale for the 17-degree peel strength test described and defined on page 33, lines 1-16, and Figure 2, of the above captioned application. I believe that a person skilled in the art would realize that the 17degree peel strength test, while not a conventional test, provides valuable information regarding oblique/diagonal areal adhesive strength properties of organic die -bonding films in a manner that is suitable for comparative testing.

12. I declare under penalty of perjury that the foregoing is true and correct, that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements so made are punishable by fine or imprisonment, or both, under 18 U.S.C. § 1001 and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

Signed by,

Date: 26, Oct., 2004

Takashi Masuko

MASUKO Takashi

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havdalah *var of* HABDALAH

¹have \(ʔ)hav, (h)əv, v; *in sense 2 before "to" usu* ʰhaf\ *vb* **had** \(ʔ)had, (h)əd, d\; **hav·ing** \ʰhav-iŋ\; **has** \(ʔ)haz, (h)əz, z, s; *in sense 2 before "to" usu* ʰhas\ [ME *haven*, fr. OE *habban*; akin to OHG *haben* to have, *hevan* to lift — more at HEAVE] *vt* **1 a** : to hold in possession as property **b** : to hold in one's use, service, or affection or at one's disposal <~ your cake and eat it too> **c** : to consist of : CONTAIN **2** : to feel obligation or necessity in regard to <~ to go> <learn to get along better, as people ~ to in . . . society —H. J. Muller> **3** : to stand in relationship to <~ enemies> **4 a** : to acquire or get possession of : OBTAIN <these shoes are the best to be *had*> **b** : RECEIVE <*had* news> **c** : ACCEPT; *specif* : to accept in marriage **d** : to copulate with **5 a** : to be marked or characterized by <~ red hair> **b** : EXHIBIT, SHOW <*had* the gall to refuse> **c** : USE, EXERCISE <~ mercy on us> **6 a** : to experience esp. by submitting to, undergoing, or suffering <~ a cold> **b** : to carry on : PERFORM, TAKE <~ a look at that cut> <~ a fight> **c** : to entertain in the mind <~ an opinion> **7 a** : to cause to by persuasive or forceful means — used with the infinitive without *to* <~ the children stay> **b** : to cause to be <*has* people around at all times> **8** : ALLOW <we'll ~ no more of that> **9** : to be competent in <*has* only a little French> **10 a** : to hold in a position of disadvantage or certain defeat <we ~ him now> **b** : to take advantage of : TRICK, FOOL <been *had* by a partner> **11** : to be able to exercise : be entitled to <I ~ my rights> **12** : BEGET, BEAR <~ a baby> **13** : to partake of <~ dinner> **14** : BRIBE, SUBORN <can be *had* for a price> ~ *verbal auxiliary* — used with the past participle to form the present perfect, past perfect, or future perfect <*has* gone home> <*had* already eaten> <will ~ finished dinner by then>

syn HAVE, HOLD, OWN, POSSESS, ENJOY *shared meaning element* : to keep, control, retain, or experience as one's own

— have at \ha-ʰvat\ : to go at or deal with : ATTACK — **have coming** : to deserve or merit what one gets, benefits by, or suffers <he *had* that *coming*> — **have done** : FINISH, STOP — **have done with** : to bring to an end : have no further concern with <let us *have done with* name-calling> — **have had it** **1** : to have had or have done all one is going to be allowed to **2** : to have experienced, endured, or suffered all one can — **have it in for** \ʰhav-ət-ʲin-fər, -ˌfȯ(ə)r\ : to intend to do harm to — **have it out** : to settle a matter of contention by discussion or a fight — **have one's eye on** **1 a** : to look at **b** : to watch constantly and attentively **2** : to have as an objective — **have to do with** **1** : to deal with <the story *has to do with* real people —Alice M. Jordan> **2** : to have a specified relationship with or effect on <refused to *have* anything *to do with* his own relatives —Roald Dahl> <the size of the brain *has* nothing *to do with* intelligence —Ruth Benedict>

²have \ʰhav\ *n* : one that is well-endowed esp. in material wealth

have·lock \ʰhav-ˌläk, -lək\ *n* [Sir Henry *Havelock*] : a covering attached to a cap to protect the neck from the sun or bad weather

ha·ven \ʰhā-vən\ *n* [ME, fr. OE *hæfen*; akin to MHG *habene* harbor, OE *hebban* to lift — more at HEAVE] **1** : HARBOR, PORT **2** : a place of safety : ASYLUM — **haven** *vt*

have-not \ʰhav-ˌnät, -ʰnät\ *n* : one that is poor esp. in material wealth

haven't \ʰhav-ənt\ : have not

have on *vt* **1** : WEAR <*has on* a new suit> **2** : to have plans for <what do you *have on* for tomorrow>

ha·ver \ʰhā-vər\ *vi* [origin unknown] *chiefly Brit* : to hem and haw

ha·vers \ʰhā-vərz\ *n pl* [*haver*] *chiefly Scot* : NONSENSE, POPPYCOCK

hav·er·sack \ʰhav-ər-ˌsak\ *n* [F *havresac*, fr. G *habersack* bag for oats, fr. *haber* oats + *sack* bag] : a bag similar to a knapsack but worn over one shoulder

ha·ver·sian canal \hə-ˌvər-zhən-\ *n, often cap H* [Clopton *Havers* †1702 E physician & anatomist] : any of the small canals through which the blood vessels ramify in bone

haversian system *n, often cap H* : a haversian canal with the concentrically arranged laminae of bone that surround it

¹hav·oc \ʰhav-ək, -ik\ *n* [ME *havok*, fr. AF, modif. of OF *havot* plunder] **1** : wide and general destruction : DEVASTATION **2** : great confusion and disorder <several small children can create ~ in a house> *syn* see RUIN

²havoc *vt* **hav·ocked; hav·ock·ing** : to lay waste : DESTROY

¹haw \ʰhȯ\ *n* [ME *hawe*, fr. OE *haga* — more at HEDGE] **1** : a hawthorn berry **2** : HAWTHORN

²haw *n* [origin unknown] : NICTITATING MEMBRANE: *esp* : an inflamed nictitating membrane of a domesticated mammal

³haw *vi* [imit.] **1** : to utter the sound represented by *haw* <hemmed and ~*ed* before answering> **2** : EQUIVOCATE <the administration hemmed and ~*ed* over the students' demands>

⁴haw *interj* — often used to indicate a vocalized pause in speaking

⁵haw \ʰhȯ\ *vb imper* [origin unknown] — used as a direction to turn to the left; compare GEE ~ *vi* : to turn to the near or left side

Ha·wai·ian \hə-ʰwī-yən, -ʰwi-(y)ən, -ʰwȯ-yən\ *n* **1** : a native or resident of Hawaii; *esp* : one of Polynesian ancestry **2** : the Polynesian language of the Hawaiians — **Hawaiian** *adj*

Hawaiian guitar *n* : a usu. electric stringed instrument consisting of a long soundboard and six to eight steel strings that are plucked while being pressed with a movable steel bar

Hawaii time *n* : the time of the 10th time zone west of Greenwich that includes the Hawaiian islands

haw·finch \ʰhȯ-ˌfinch\ *n* [¹*haw*] : a Eurasian finch (*Coccothraustes coccothraustes*) with a large heavy bill and short thick neck and the male marked with black, white, and brown

¹hawk \ʰhȯk\ *n* [ME *hauk*, fr. OE *hafoc*; akin to OHG *habuh* hawk, Russ *kobets*, a falcon] **1** : any of numerous diurnal birds of prey belonging to a suborder (Falcones of the order Falconiformes) and including all the smaller members of this group; *esp* : ACCIPITER — compare OWL **2** : a small board or metal sheet with a handle on the underside used to hold mortar **3** : an individual who takes a militant attitude (as in a dispute) and advocates immediate vigorous action; *esp* : a supporter of a war or warlike policy — compare DOVE — **hawk·ish** \ʰhȯ-kish\ *adj* — **hawk·ish·ly** *adv* — **hawk·ish·ness** *n*

²hawk *vi* **1** : to hunt birds by means of a trained hawk **2** : to soar and strike like a hawk ~ *vt* : to hunt on the wing like a hawk

³hawk *vt* [back-formation fr. ²*hawker*] : to offer for sale by calling out in the street <~ *ing* newspapers>

⁴hawk *vb* [imit.] *vi* : to utter a harsh guttural sound in or as if in trying to clear the throat ~ *vt* : to raise by hawking <~ up phlegm>

⁵hawk *n* : an audible effort to force up phlegm from the throat

¹hawk·er \ʰhȯ-kər\ *n* : FALCONER

²hawker *n* [by folk etymology fr. LG *höker*, fr. MLG *hōker*, fr. *hōken* to peddle; akin to OE *hēah* high] : one that hawks wares

Hawk-eye \ʰhȯ-ˌkī\ *n* : a native or resident of Iowa — used as a nickname

hawk-moth \ʰhȯk-ˌmȯth\ *n* : any of numerous rather large stout-bodied moths (family Sphingidae) with a long proboscis which at rest is kept coiled, long strong narrow fore wings more or less pointed at the ends, and small hind wings — called also *sphinx*

hawks·bill \ʰhȯks-ˌbil\ *n* : a carnivorous sea turtle (*Eretmochelys imbricata*) whose shell yields a valuable tortoiseshell

hawk·weed \ʰhȯ-ˌkwēd\ *n* : any of several composite plants (as of the genera *Hieracium*, *Picris*, and *Erechtites*) usu. having flower heads with red or orange rays

hawse \ʰhȯz\ *n* [ME *halse*, fr. ON *hals* neck, hawse — more at COLLAR] **1 a** : HAWSEHOLE **b** : the part of a ship's bow that contains the hawseholes **2** : the arrangement of the anchor cables of a ship when both a port and starboard anchor are used **3** : the distance between a ship's bow and her anchor

hawse-hole \-ˌhōl\ *n* : a hole in the bow of a ship through which a cable passes

haw·ser \ʰhȯ-zər\ *n* [ME, fr. AF *hauceour*, fr. MF *haucier* to hoist, fr. (assumed) VL *altiare*, fr. L *altus* high — more at OLD] : a large rope for towing, mooring, or securing a ship

hawser bend *n* : a method of joining the ends of two heavy ropes by means of seizings

haw·ser-laid \ˌhȯ-zər-ʰlād\ *adj* : CABLE-LAID

haw·thorn \ʰhȯ-ˌthȯ(ə)rn\ *n* [ME *hawethorn*, fr. OE *hagathorn*, fr. *haga* hawthorn + *thorn* — more at HEDGE] : any of a genus (*Crataegus*) of spring-flowering spiny shrubs (as the European *C. oxyacantha* and the American *C. coccinea*) of the rose family with glossy and often lobed leaves, white or pink fragrant flowers, and small red fruits

Haw·thorne effect \ʰhȯ-thȯrn-\ *n* [fr. the *Hawthorne* Works of the Western Electric Co., Cicero, Ill., where its existence was established by experiment] : the stimulation to output or accomplishment (as in an industrial or educational methods study) that results from the mere fact of being under concerned observation

¹hay \ʰhā\ *n* [ME *hey*, fr. OE *hīeg*; akin to OHG *hewi* hay, OE *hēawan* to hew] **1** : herbage and esp. grass mowed and cured for fodder **2** : REWARD **3** *slang* : BED **4** : a small sum of money <a saving of . . . $14 million is not ~ —H.C. Schonberg>

²hay *vi* : to cut, cure, and store for hay ~ *vt* : to feed with hay

hay·cock \ʰhā-ˌkäk\ *n* : a somewhat rounded conical pile of hay

hay·er \ʰhā-ər, ʰhe(-ə)r\ *n* : one that hays

hay fever *n* : an acute allergic nasal catarrh and conjunctivitis; *esp* : POLLINOSIS

hay·fork \ʰhā-ˌfȯ(ə)rk\ *n* : a fork that is mechanically operated or held in the hand and that is used for loading or unloading hay

hay·lage \ʰhā-lij\ *n* [*hay* + *silage*] : a stored forage that is essentially a grass silage wilted to 35 to 50 percent moisture

hay·loft \ʰhā-ˌlȯft\ *n* : a loft esp. for storing hay

hay-mak·er \-ˌmā-kər\ *n* **1** : HAYER **2** : a powerful blow

hay·mow \-ˌmaù\ *n* : a mow esp. of or for hay

hay·rack \-ˌrak\ *n* **1** : a frame mounted on the running gear of a wagon and used esp. in hauling hay or straw; *also* : a wagon equipped with a hayrack **2** : a feeding rack that holds hay for livestock

hay·rick \-ˌrik\ *n* : a relatively large sometimes thatched outdoor pile of hay : HAYSTACK

hay·ride \-ˌrīd\ *n* : a pleasure ride usu. at night by a group in a wagon, sleigh, or open truck partly filled with straw or hay

hay·seed \ʰhā-ˌsēd\ *n, pl* **hayseed** *or* **hayseeds** **1 a** : seed shattered from hay **b** : clinging bits of straw or chaff from hay **2** *pl hayseeds* : BUMPKIN, YOKEL

hay·stack \-ˌstak\ *n* : a stack of hay

hay·wire \-ˌwī(ə)r\ *adj* [fr. the use of baling wire for makeshift repairs] **1** : hastily or shoddily made **2** : being out of order — often used with *go* <the radio went ~> **3** : emotionally or mentally upset : CRAZY — often used with *go* <went completely ~ after the accident>

ha·zan \kə-ʰzän, ʰkäz-ᵊn\ *n, pl* **ha·za·nim** \kə-ʰzän-əm\ [LHeb *hazzān*] **1** : an official of a Jewish synagogue or community of the talmudic period **2** : CANTOR 2

¹haz·ard \ʰhaz-ərd\ *n* [ME, fr. MF *hasard*, fr. Ar *az-zahr* the die] **1** : a game of chance like craps played with two dice **2** : a source of danger **3 a** : CHANCE **b** : a chance event : ACCIDENT **4** *obs* : STAKE 3a **5** : a golf-course obstacle — **at hazard** : at stake

²hazard *vt* : VENTURE, RISK <~ a guess>

haz·ard·ous \ʰhaz-ərd-əs\ *adj* **1** : depending on hazard or chance **2** : involving or exposing one to risk (as of loss or harm) <a ~ occupation> <handling ~ materials> *syn* see DANGEROUS — **haz·ard·ous·ly** *adv* — **haz·ard·ous·ness** *n*

¹haze \ʰhāz\ *vb* **hazed; haz·ing** [prob. back-formation fr. *hazy*] *vi* : to become hazy or cloudy ~ *vt* : to make hazy, dull, or cloudy

²haze *n* [prob. back-formation fr. *hazy*] **1 a** : fine dust, smoke, or light vapor causing lack of transparency of the air **b** : a cloudy appearance in a transparent liquid or solid; *also* : a dullness of finish (as on furniture) **2** : vagueness of mind or mental perception

syn HAZE, FOG, MIST, SMOG *shared meaning element* : an atmospheric condition that deprives the air of its transparency

³haze *vt* **hazed; haz·ing** [origin unknown] **1 a** : to harass by exacting unnecessary or disagreeable work **b** : to harass by banter, ridicule, or criticism **2** : to haze by way of initiation <~ the

: a legal inference as to the existence or truth of a fact not certainly known that is drawn from the known or proved existence of some other fact

pre·sump·tive \-'zəm(p)-tiv\ *adj* **1** : giving grounds for reasonable opinion or belief **2**: based on probability or presumption **3** : being an embryonic precursor with the potential for forming a particular structure or tissue in the normal course of development <~ neural tissue> — **pre·sump·tive·ly** *adv*

pre·sump·tu·ous \pri-'zəm(p)-chə(-w)əs, -shəs\ *adj* [ME, fr. MF *presumptueux*, fr. LL *praesumptuosus*, irreg. fr. *praesumptio*] : overstepping due bounds : taking liberties : OVERWEENING — **pre·sump·tu·ous·ly** *adv* — **pre·sump·tu·ous·ness** *n*

pre·sup·pose \prē-sə-'pōz\ *vt* [ME *presupposen*, fr. MF *presupposer*, fr. ML *praesupponere* (perf. indic. *praesupposui*), fr. L *prae-* + ML *supponere* to suppose — more at SUPPOSE] **1** : to suppose beforehand **2** : to require as an antecedent in logic or fact — **pre·sup·po·si·tion** \(,)prē-,səp-ə-'zish-ən\ *n*

pre·syn·ap·tic \,prē-sə-'nap-tik\ *adj* : situated or occurring just before a nerve synapse — **pre·syn·ap·ti·cal·ly** \-ti-k(ə-)lē\ *adv*

pre·tax \'prē-'taks\ *adj* : existing before provision for taxes

pre·teen \-'tēn\ *n* : a preadolescent child — **preteen** *adj*

pre·tend \pri-'tend\ *vb* [ME *pretenden*, fr. L *praetendere* to allege as an excuse, lit., to stretch in front of like a curtain, fr. *prae-* pre- + *tendere* to stretch — more at THIN] *vt* **1** : to give a false appearance of being, possessing, or performing : PROFESS <does not ~ that he is a psychiatrist> **2 a** : to make believe : FEIGN <he ~*ed* deafness> **b** : to claim, represent, or assert falsely <~*ing* an emotion he could not really feel> **3** : VENTURE, UNDERTAKE ~ *vi* **1** : to feign an action, part, or role in play **2** : to put in a claim *syn* see ASSUME

pre·tend·ed *adj* : professed or avowed but not genuine <~ affection> — **pre·tend·ed·ly** *adv*

pre·tend·er \pri-'ten-dər\ *n* : one that pretends: as **a** : one who lays claim to something; *specif* : a claimant to a throne who is held to have no just title **b** : one who makes a false or hypocritical show <a ~ to spirituality —Elaine L. Lawrence>

pre·tense *or* **pre·tence** \'prē-,ten(t)s, pri-'\ *n* [ME, fr. MF *pretensse*, fr. (assumed) ML *praetensa*, fr. LL, fem. of *praetensus*, pp. of L *praetendere*] **1** : a claim made or implied; *esp* : one not supported by fact **2 a** : mere ostentation : PRETENTIOUSNESS <confuse dignity with pomposity and ~ —Bennett Cerf> **b** : a pretentious act or assertion **3** : an inadequate or insincere attempt to attain a certain condition or quality **4** : professed rather than real intention or purpose : PRETEXT <was there under false ~*s*> **5** : MAKE-BELIEVE, FICTION **6** : false show : SIMULATION <saw through his ~ of indifference>

syn PRETENSE, PRETENSION, MAKE-BELIEVE *shared meaning element* : the offering of something false as real or true

¹pre·ten·sion \pri-'ten-chən\ *n* **1** : an allegation of doubtful value : PRETEXT **2** : a claim or an effort to establish a claim **3** : ASPIRATION, INTENTION **5** : VANITY, PRETENTIOUSNESS *syn* see PRETENSE, AMBITION — **pre·ten·sion·less** \-ləs\ *adj*

²pre·ten·sion \(')prē-'ten-chən\ *vt* [*pre-* + ²*tension*] : PRESTRESS

pre·ten·tious \pri-'ten-chəs\ *adj* [F *prétentieux*, fr. *prétention* pretension, fr. ML *praetention-*, *praetentio*, fr. L *praetentus*, pp. of *praetendere*] **1** : making usu. unjustified or excessive claims (as of value or standing) <the ~ fraud who assumes a love of culture that is alien to him —Richard Watts> **2** : making demands on one's skill, ability, or means : AMBITIOUS <the ~ daring of the Green Mountain Boys in crossing the lake —*Amer. Guide Series: VL*> *syn* see SHOWY — **pre·ten·tious·ly** *adv* — **pre·ten·tious·ness** *n*

pret·er·it *or* **pret·er·ite** \'pret-ə-rət\ *adj* [ME *preterit*, fr. MF, fr. L *praeteritus*, fr. pp. of *praeterire* to go by, pass, fr. *praeter* beyond, past, by (fr. compar. of *prae* before) + *ire* to go — more at FOR, ISSUE] **1** *archaic* : BYGONE, FORMER **2** : of, relating to, or constituting a verb tense that indicates action in the past without reference to duration, continuance, or repetition — **preterit** *n*

pre·ter·mi·nal \(')prē-'tərm-nəl, -ən-ᵊl\ *adj* : occurring before death

pre·ter·mis·sion \,prēt-ər-'mish-ən\ *n* [L *praetermission-*, *praetermissio*, fr. *praetermissus*, pp. of *praetermittere*] : the act or an instance of pretermitting : OMISSION

pre·ter·mit \-'mit\ *vt* **-mit·ted; -mit·ting** [L *praetermittere*, fr. *praeter* by, past + *mittere* to let go, send — more at SMITE] **1** : to let pass without mention or notice : OMIT **2** : to leave undone : NEGLECT **3** : to break off : SUSPEND

pre·ter·nat·u·ral \,prēt-ər-'nach(-ə)-rəl\ *adj* [ML *praeternaturalis*, fr. L *praeter naturam* beyond nature] **1** : existing outside of nature **2** : exceeding what is natural or regular : EXTRAORDINARY <wits trained to ~ acuteness by the debates —G. L. Dickinson> **3** : inexplicable by ordinary means; *esp* : PSYCHIC <~ phenomena> — **pre·ter·nat·u·ral·ly** \-rə-lē, -'nach-ər-lē\ *adv* — **pre·ter·nat·u·ral·ness** \-'nach(-ə)-rəl-nəs\ *n*

pre·test \(')prē-'\ *n* : a preliminary test serving for exploration rather than evaluation — **pretest** *vt*

pre·text \'prē-,tekst\ *n* [L *praetextus*, fr. *praetextus*, pp. of *praetexere* to assign as a pretext, lit., to weave in front, fr. *prae-* + *texere* to weave — more at TECHNICAL] : a purpose or motive alleged or an appearance assumed in order to cloak the real intention or state of affairs *syn* see APOLOGY

pre·tor, pre·to·ri·an *var of* PRAETOR, PRAETORIAN

pre·treat \(')prē-'trēt\ *vt* : to treat beforehand

¹pre·treat·ment \-mənt\ *n* : the process of pretreating

²pretreatment *adj* : occurring in or typical of the period prior to treatment

pret·ti·fy \'prit-i-,fī, 'pərt-, 'prət-\ *vt* **-fied; -fy·ing** : to make pretty — **pret·ti·fi·ca·tion** \,prit-i-fə-'kā-shən, ,pərt-, ,prət-\ *n*

pret·ti·ness \'prit-ē-nəs, 'pərt-, 'prət-\ *n* **1** : the quality or state of being pretty **2** : something pretty

¹pret·ty \'prit-ē, 'pərt-, 'prət-\ *adj* **pret·ti·er; -est** [ME *praty, prety*, fr. OE *prættig* tricky, fr. *prætt* trick; akin to ON *prettr* trick] **1 a** : ARTFUL, CLEVER **b** : PAT, APT **2 a** : pleasing by delicacy or grace **b** : having conventionally accepted elements of beauty **c** : appearing or sounding pleasant or nice but lacking strength, force, manliness, purpose, or intensity <~ words that make no sense —Elizabeth B. Browning> **3 a** : MISERABLE, TERRIBLE <a ~ mess you've gotten us into> **b** *chiefly Scot* : STOUT **4** : moderately large : CONSIDERABLE <a very ~ profit> *syn* see BEAUTIFUL *ant* plain — **pret·ti·ly** \-ᵊl-ē\ *adv* — **pret·ty·ish** \-ē-ish\ *adj*

²pret·ty \,pərt-ē, pərt-ē (*unstressed* pərt-), ,prit-ē, ,prət-ē; *before* "*near(ly)*" *often without* -ē\ *adv* **1** : in some degree : MODERATELY <~ cold weather> **2** *archaic* : in a pretty manner : PRETTILY

³pret·ty \'prit-ē, 'pərt-ē, 'prət-ē\ *vt* **pret·tied; pret·ty·ing** : to make pretty — usu. used with *up* <curtains to ~ up the room>

⁴pretty *like*¹\ *n, pl* **pretties** **1** : a pretty person or thing **2** *pl* : dainty clothes; *esp* : LINGERIE

pre·tu·ber·cu·lous \,prē-t(y)ü-'bər-kyə-ləs\ *or* **pre·tu·ber·cu·lar** \-lər\ *adj* **1** : preceding the development of lesions definitely identifiable as tuberculous **2** : likely to develop tuberculosis

pret·zel \'pret-səl\ *n* [G *brezel*, deriv. of L *brachiatus* having branches like arms, fr. *brachium* arm — more at BRACE] : a brittle glazed and salted cracker typically having the form of a loose knot

prev *abbr* previous; previously

pre·vail \pri-'vā(ə)l\ *vi* [ME *prevailen*, fr. L *praevalēre*, fr. *prae-* pre- + *valēre* to be strong — more at WIELD] **1** : to gain ascendancy through strength or superiority : TRIUMPH **2** : to be or become effective or effectual **3** : to use persuasion successfully <~*ed* on him to sing> **4** : to be frequent : PREDOMINATE <the west winds that ~ in the mountains> **5** : to be or continue in use or fashion : PERSIST <a custom that still ~*s*> *syn* see INDUCE

pre·vail·ing \-'vā-liŋ\ *adj* **1** : having superior force or influence **2 a** : most frequent <~ winds> **b** : generally current : COMMON — **pre·vail·ing·ly** \-liŋ-lē\ *adv*

syn PREVAILING, PREVALENT, RIFE, CURRENT *shared meaning element* : general (as in circulation, acceptance, or use) in a given place or at a given time

prev·a·lence \'prev(-ə)-lən(t)s\ *n* **1** : the quality or state of being prevalent **2** : the degree to which something is prevalent; *esp* : the percentage of a population that is affected with a particular disease at a given time

prev·a·lent \-lənt\ *adj* [L *praevalent-*, *praevalens* very powerful, fr. prp. of *praevalēre*] **1** *archaic* : POWERFUL **2** *archaic* : being in ascendancy : DOMINANT **3** : generally or widely accepted, practiced, or favored : WIDESPREAD *syn* see PREVAILING — **prevalent** *n* — **prev·a·lent·ly** *adv*

pre·var·i·cate \pri-'var-ə-,kāt\ *vi* **-cat·ed; -cat·ing** [L *praevaricatus*, pp. of *praevaricari* to walk crookedly, fr. *prae-* + *varicus* having the feet spread apart, fr. *varus* bent, knock-kneed; prob. akin to OE *wōh* crooked, L *vacillare* to sway, *vagus* wandering] : to deviate from the truth : EQUIVOCATE *syn* see LIE — **pre·var·i·ca·tion** \-,var-ə-'kā-shən\ *n* — **pre·var·i·ca·tor** \-'var-ə-,kāt-ər\ *n*

pré·ve·nance \'prā-və-,näⁿs, prev-näⁿs\ *n* [F, fr. *prévenant*, prp. of *prévenir* to anticipate, fr. L *praevenire*] : attentiveness to or anticipation of others' needs

pre·ve·nient \pri-'vē-nyənt\ *adj* [L *praevenient-*, *praeveniens*, prp. of *praevenire*] : ANTECEDENT, ANTICIPATORY — **pre·ve·nient·ly** *adv*

pre·vent \pri-'vent\ *vb* [ME *preventen* to anticipate, fr. L *praeventus*, pp. of *praevenire* to come before, anticipate, forestall, fr. *prae-* + *venire* to come — more at COME] *vt* **1** *archaic* **a** : to be in readiness for (as an occasion) **b** : to meet or satisfy in advance **c** : to act ahead of **d** : to arrive before **2** *archaic* : to go before with spiritual guidance <O let thy grace . . . ever ~, accompany, and follow me —Thomas Ken> **3** : to deprive of power or hope of acting or succeeding **4** : to keep from happening or existing <steps to ~ war> **5** : to hold or keep back : HINDER, STOP — often used with *from* ~ *vi* : to interpose an obstacle — **pre·vent·abil·i·ty** \-,vent-ə-'bil-ət-ē\ *n* — **pre·vent·able** *also* **pre·vent·ible** \-'vent-ə-bəl\ *adj* — **pre·vent·er** *n*

syn PREVENT, PRECLUDE, OBVIATE, AVERT, WARD OFF *shared meaning element* : to stop from advancing or occurring *ant* permit

pre·ven·ta·tive \-'vent-ət-iv\ *adj or n* : PREVENTIVE

pre·ven·tion \pri-'ven-chən\ *n* : the act of preventing or hindering

¹pre·ven·tive \-'vent-iv\ *n* : something that prevents; *esp* : something used to prevent disease

²preventive *adj* **1** : devoted to or concerned with prevention : PRECAUTIONARY <~ steps against soil erosion> **2** : undertaken to forestall anticipated hostile action <~ war> — **pre·ven·tive·ly** *adv* — **pre·ven·tive·ness** *n*

pre·ver·bal \(')prē-'vər-bəl\ *adj* **1** : occurring before the verb **2** : having not yet acquired the faculty of speech <a ~ child>

¹pre·view \'prē-,vyü\ *vt* **1** : to see beforehand; *specif* : to view or to show in advance of public presentation **2** : to give a preliminary survey of

²preview *n* **1** : an advance showing or performance (as of a motion picture or play) **2** *also* **pre·vue** \-,vyü\ : a showing of snatches from a motion picture advertised for appearance in the near future **3** : a statement giving advance information : FORETASTE **4** : a preliminary survey

pre·vi·ous \'prē-vē-əs\ *adj* [L *praevius* leading the way, fr. *prae-* pre- + *via* way — more at VIA] **1** : going before in time or order **2** : acting too soon : PREMATURE *syn* see PRECEDING *ant* subsequent — **pre·vi·ous·ly** *adv* — **pre·vi·ous·ness** *n*

previous question *n* : a parliamentary motion that the pending question be put to an immediate vote without further debate or amendment and that if defeated has the effect of permitting resumption of debate

previous to *prep* : prior to : BEFORE

¹pre·vi·sion \prē-'vizh-ən\ *n* [LL *praevision-*, *praevisio*, fr. L *praevisus*, pp. of *praevidēre* to foresee, fr. *prae-* + *vidēre* to see — more at WIT] **1** : FORESIGHT, PRESCIENCE **2** : FORECAST, PROGNOSTICATION — **pre·vi·sion·al** \-'vizh-nəl, -ən-ᵊl\ *adj* — **pre·vi·sion·ary** \-'vizh-ə-,ner-ē\ *adj*

²prevision *vt* **pre·vi·sioned; pre·vi·sion·ing** \-'vizh-(ə-)niŋ\ : FORESEE

pre·vo·cal·ic \,prē-vō-'kal-ik, -və-\ *adj* [ISV] : immediately preceding a vowel